

SURVEY OF SAVANNAH AND TENNESSEE RIVERS.

MESSAGE

FROM THE

PRESIDENT OF THE UNITED STATES,

Transmitting a report of the Secretary of War of the survey of the Savannah and Tennessee rivers.

FEBRUARY 10, 1832.

Read, and referred to the Committee on Internal Improvements.

WASHINGTON, February 10, 1832.

In compliance with the resolution of the House of Representatives of the 3d of March, 1831, I herewith transmit a report of the Secretary of War "of the survey of the Savannah and Tennessee rivers, made in 1828."

ANDREW JACKSON.

DEPARTMENT OF WAR,

February 8, 1832.

The Secretary of War, to whom was referred the resolution of the House of Representatives of the 3d of March, 1831, requesting the President to have transmitted to that House, "early" in the next session, a report of the survey of the Savannah and Tennessee rivers, made in 1828," has the honor to enclose the report required.

Respectfully submitted.

LEW. CASS.

To the PRESIDENT of the United States.

TOPOGRAPHICAL BUREAU,

February 8, 1832.

SIR: I have the honor to lay before you a report of a reconnoissance and preliminary survey between the Savannah and Tennessee rivers, by Major

Bache, of the topographical engineers, and called for by a resolution of the House of Representatives of the 3d of March, 1831.

With great respect,

I remain, sir,

Your obedient servant,

JOHN J. ABERT,

Lieut. Col. Top. Eng'rs.

Honorable LEWIS CASS,
Secretary of War.

Report of a reconnoissance and a preliminary survey between the Savannah and Tennessee rivers, by Major H. Bache, United States' topographical engineer, January 18, 1832.

Lieutenant Colonel J. J. ABERT,
Topographical Bureau.

SIR: In obedience to the instructions of the Engineer Department of the 12th June, 1828, requiring examinations and surveys to be made to ascertain the practicability and the nature of a communication to connect the Savannah and Tennessee rivers, I have the honor to present the following report, accompanied by plans and profiles, numbered each from 1 to 5, and a map exhibiting the deep cut, and feeders proposed for the supply and passage of the summit.

Any system of communication to connect the Savannah with the Tennessee, must proceed from Andersonville, at the junction of the Toogaloo and Seneca, the highest navigable point on the Atlantic side. For this purpose three different routes present themselves; namely, by the head branches of the Savannah river to the Hiwassee, Little Tennessee, and French Broad rivers, respectively, tributaries of the Tennessee.

The general opinion entertained of the difficult character of the country in the first direction, and the favorable account received of the two latter routes, particularly that by the Little Tennessee, offered, when the smallness of the party was considered, every inducement for their prior examination. As the practicability of a communication in this direction, between the Atlantic and the waters of the Mississippi, depends upon the ability to pass the mountains, the examinations and surveys were confined to that section of country embraced by Walton's ford on the Toogaloo, and the head of the Seneca, on the Atlantic side, and Russell's ferry, on the Little Tennessee, and Dandridge, on the French Broad, on the side of the tributaries of the Mississippi, leaving the extension of the surveys, should the results now presented render such a course desirable, to future operations.

The main feature in these routes, as in every other between the waters of the Mississippi and Atlantic, is the elevated region designated further north as the Alleghany, and in this section of country as the Blue ridge, and the Smoky or Unakoy mountain, which prolong the general course northeast and southwest of the whole chain. The breadth of this elevated region by the Little Tennessee route, from Walton's ford, on the Toogaloo, to Talassee, upon that river, is about 113 miles. Proceeding westwardly, the greatest elevation at the summit of the Blue ridge is attained in about thirty-five miles, whence, by the Little Tennessee and French Broad, the descent is

more gradual, until those rivers break through the Smoky or Unakoy mountain.

The accidents of ground by the head waters of the Savannah are, for the most part, uniform. Parallel ridges, perpendicular to the general direction of the streams, occur in quick succession to the very summit of the range; the margins of the streams presenting all the varieties of ground, from the gentle glade to the rocky and precipitous hill side. The flats occur more frequently, and to a greater extent, as the streams incline more in the direction of the master range. This is the case for the first few miles of the Stekoa above its mouth, when it assumes a course rather south of west, giving it the appearance of a tributary to the Chechero. The streams pursued in these routes are successively basins of still water, rapids, and falls, the latter of every intermediate height to 52 feet, the elevation of the great falls on the Stekoa.

Between the Blue ridge and the Smoky mountain, the country may be compared to an immense basin, encompassed by these heights. Subordinate ranges run across the direction of the Alleghany, dividing the head waters of the several tributaries of the Tennessee proper. The slope of this basin, for some distance from the summit, is so gradual, that the eye is unable to determine the direction of the inclination of the extensive bottoms skirting the rivers, which here resemble the streams of a lowland region flowing gently in their serpentine courses, receding from, or approaching, at intervals, the higher grounds, which contract or expand the bottoms to unequal widths. These bottoms, near the sources of the Little Tennessee and French Broad, are raised but a few feet above the streams, but become relatively more elevated, until, in the course of twelve or fifteen miles, they attain a height of ten or twelve feet. The valleys of these rivers vary in extent as you descend from a narrow margin to a breadth of from three to five miles, bounded by hills of from 1,000 to 1,500 feet in height, which, closing in again, contract them to the width of the streams as they break through the Smoky mountain.

It would appear that the general level of the most elevated points of the country is nearly maintained from the summit at the Blue ridge westward, until the Tennessee valley is reached by the rapid descent of the Smoky mountain; and that the streams tributary to the Tennessee, having a greater declivity, become more and more depressed below the tops of the hills, until, at the moment of their release through the mountains to the west, they are some thousand feet below their summits. In the routes examined, as well as in all others having in view to connect the Savannah waters with those of the Tennessee, the passage of this range will present the most formidable difficulties.

The mineral resources of this region have not yet been fully developed. But little doubt is entertained, however, from the indications observed, and the analogous conformation of the range, that valuable productions, particularly iron and coal, will be here discovered. This discovery is very desirable, as, at the same time that the mineral wealth is rendered available by the facilities of transport, it would become an efficient aid in creating the resources necessary to carry on and maintain the means of communication.

Excellent stone, suitable for the necessary constructions, abound throughout the routes, consisting chiefly of granite and flinty masses. Lime stone was found only on the western face of the Smoky mountain; but examinations made to supply the apparent deficiency in the eastern portions of the

route, would doubtless be successful. The timber consists of many kinds applicable to the construction of bridges, rails, &c.; namely, red, white, and black oak, black and white hickory, poplar, black walnut, chesnut, locust, gum and pine; the latter being found only in the lower districts of the mountains, on both the eastern and western faces.

As already remarked, the routes examined were two. *First route*, from the mouth of Panther's creek, assumed as the point of departure, by the Toogaloo and Chatuga rivers, and Chechero and Stekoa creeks, to the summit; thence, by the Little Tennessee, to Russell's ferry. *Second route*, proceeding from the west from Dandridge, Tennessee, to the source of the French Broad, by the west fork and Abraham's branch, to the summit; thence, by the Frozen branch, main fork of the Toscaway, the Toscaway itself, and the Keowee, to its mouth.

Simultaneously with the examination of these routes, it was deemed advisable to enter upon a preliminary survey of the first, with a view to general results, as that route was represented to offer the greatest facilities for the junction of the Savannah and Tennessee waters. For the convenience of description, the subdivisions will be made less with reference to extent, than to the characteristics of each.

PRELIMINARY SURVEY OF THE FIRST ROUTE.

SUBDIVISION FIRST.

From the mouth of Panther's creek, by the Toogaloo and Chatuga, to the mouth of Lick-Log creek. Distance, 6.75 miles; ascent, 137.77 feet; ascent per mile, 20.41 feet; locks 17; general course, north, circuitous and moderately serpentine.

Commencing at a point on the east side of the Toogaloo, the ground is generally favorable for 0.9 of a mile, it being table land, and for the most part cultivated; then for 0.6 of a mile the hills encroach upon the river, rising at angles varying from 10° to 45° . The character of the ground for the next 0.6 of a mile is cultivated table or flat land. The line now crosses the river at a point where it turns suddenly to the right, and pursues the west shore for 1.5 miles along hill sides, at angles from 10° to 60° , when the ground becomes favorable for 0.2 of a mile; then rocky bluffs for the same distance, succeeded by table land for 0.9 of a mile; partly cultivated. The next 0.1 of a mile is hill sides of about 25° , succeeded by 0.6 of cultivated table lands; thence, to the mouth of Lick-Log creek 1.1 of a mile, through hill sides of from 25° to 50° , and rocky bluffs.

With the exception of the table land, the ridges, running transversely to the direction, project quite into the stream, in some places exhibiting rugged and precipitous fronts. The largest portions, however, of the margins of the river possess more the appearance of elevated grounds, skirting streams whose general course is more nearly parallel to, than across the direction of the ridges.

It is believed that the line of levels will not vary much from the final trace of any work for this subdivision; the course selected on each side of the river being essentially more favorable than any that would be found on the opposite. The erection of any work for crossing the mouth of the Tallulah, which empties into the river from Georgia, will considerably in-

crease the cost of a location on that side; though it may well be questioned whether the expense may not be advantageously incurred, under a due regard to economy, in preference to continuing the work on the east side. The erection of dams at convenient points on the main stream, formed at comparatively small cost, will readily yield an abundant supply of water for all the purposes of the largest size canal.

Between Panther's and Lick-Log creeks, the river has not a uniform rise throughout. In the first 2 miles an elevation of but 28 feet is attained, when the ascent becomes more rapid for the succeeding 1.5 miles, being 56 feet, including the Goggelin shoals or rapids; then a moderate rise of 28 feet in 2.6 miles, followed by a more abrupt one of 26 feet in 0.6, to the mouth of Lick-Log. Assuming the four planes as the grade of a railroad, the elevations of each, though in two somewhat excessive, could be readily overcome by means of locomotive power. It remains, however, to be determined, whether the grades could not partake of greater uniformity, and be adopted with a due regard to the great elevation to be surmounted in the next subdivision.

SUBDIVISION SECOND.

From the mouth of Lick-Log creek, by the Chatuga, to the mouth of Chechero creek. Distance, 3.92 miles; ascent, 239.88 feet; ascent per mile, 60.33 feet; locks, 30; general course, north 10° east, direct and serpentine.

The difficulties to be encountered in this subdivision, in the construction of either a canal or railroad, are of the most formidable description, requiring the maximum cost of such works; the frequent recurrence of hill sides rising abruptly from the water, at very great angles, and of rocky bluffs, renders it one of no ordinary character. With the exception of the ascent of the Stekoa at the Great falls, and the breaking through of the Little Tennessee at the Smoky mountain, this portion of the Chatuga presents greater difficulties to the success of either means of internal communication than any other of the route. Through the whole distance it would be necessary to place the outer edge of the constructions in the bed of the stream; and, as these would have to be raised above the reach of the highest freshets, the most substantial work could only guaranty them from the effect of the torrents, when further compressed within their natural and very narrow limits. Materials of the fittest kind, and in great abundance, are at hand for the erection of these massive structures; but the precipitous nature of the ground, which renders their employment easy, also gives rise to serious apprehensions for the safety of the constructions which are liable to be crushed by the descent of masses of rock from the heights.

The supply of water for a canal can be drawn from the main stream, which is here amply sufficient for the largest expenditure; though it may be desirable to receive a portion of the supply from its tributaries, which present themselves at convenient distances, and are well adapted to subserve that end.

In case of a preference for a railroad, the average grade per mile is too great to be overcome profitably by locomotive power. Further surveys can alone determine, whether, by maintaining a higher level in the first subdivision, the grade might not be so reduced as to make that power applicable.

Although the description of the ground is applicable generally to either shore of the river, doubtless more thorough examinations, having such an

object in view, will enable a just discrimination to be made of the facilities afforded by each, inducing, probably, the crossing of the river in one or two instances to take advantage of the more favorable side. Indeed, from the serpentine course of the river within the above limits, forming at times short turns, this may become an expedient of absolute necessity to soften as much as possible the abruptness of the curves, should a railroad meet with most favor. Should such a course become necessary, the narrowness of the main stream, and the very limited rise in the freshets, would render the construction of aqueducts or viaducts of easy accomplishment, and comparatively at little expense. These, and other questions of a similar nature, can alone be determined by other and more minute surveys.

SUBDIVISION THIRD.

From the mouth of Chechero creek, by the Chechero, to the mouth of Stekoa creek. Distance, 5.45 miles; ascent, 447.34 feet; ascent per mile, 82 feet; locks, 56; general course, north 30° west, direct and serpentine.

The great elevation in this distance, and the difficulties of the ground, combine to render this subdivision one of extreme difficulty. With the exception of about a fourth of the distance, the mountains rise abruptly from the water's edge, and the small proportion of favorable ground can only be taken advantage of by crossing the stream several times. The proper points of crossing can only be decided upon by a more minute examination.

The ground may be thus described: 1.5 miles hill sides to water's edge, angle from 10° to 60° ; table land, cultivated for 0.5; hill sides less abrupt for 1.1 miles, the angles of whose slopes, near the water's edge, range from 10° to 30° . Another portion of cultivated table land succeeds, in extent, 0.4 of a mile, and 0.8 is followed by steep hill sides, at angles from 25° to 70° ; which, after 0.1 of cultivated flat land, closes in again at these abrupt angles for 0.7 of a mile more, which, however, subside in the next 0.1 to slopes of 10° to 15° . The remaining distance of 0.3 of a mile to the mouth of Stekoa is favorable ground.

The great rise in this and the preceding subdivision renders a resort to stationary power absolutely necessary. For this purpose, the elevation being by three unequal steps of 241 feet in 1.4 miles, 33 feet in 1.3, and 173 feet in 2.7 miles, two inclined planes for the first, and one for the last, would be sufficient. It will be perceived, that, although the average rise is not too great to allow sufficient room for the necessary number of locks, yet the excessive rise in the first 1.4 miles will make this arrangement difficult, and only applicable to the case, by the adoption of the expensive system, particularly so when applied to the ground in this instance of lateral basins.

SUBDIVISION FOURTH.

From the mouth of the Stekoa, by that stream, to a point 550 feet above Star branch. Distance, 3.9 miles; ascent, 75.19 feet; ascent per mile, 19.27 feet; locks, 9.5; general course, south 75° west, direct and tolerably serpentine.

This subdivision comprises that portion of the Stekoa which runs nearly parallel to the Alleghany, and is strongly contrasted in the nature of its valley with those of streams flowing transversely to the ridges. The abrupt ascent of the next subdivision, in which the Stekoa suddenly resumes the usual

course to the summit, may be considerably lessened by maintaining a higher level in this. It may become a question for future consideration, whether it would be advisable to pursue this stream, or take a more direct route to the summit by the Chechero. The greater depression of the mountain, and the more abundant supply of water of the summit, however, at the head of the Stekoa, would seem, from the present information, to render the route by this stream the more eligible.

With one or two exceptions, where hill sides of easy slopes occur, cultivated bottoms and table lands extend throughout the whole of this subdivision, the slight difficulties of which may be readily overcome by either a canal or railroad, by crossing the stream at a few favorable points.

The ground may be thus described. 1.2 of a mile cultivated table land; hill sides of 10° to 20° for the same distance; 0.1 table lands; 0.1 hill sides of easy slopes; 3.2 bottoms; and 0.1 hill sides; angles, 25° to 50° .

The quantity of water was gauged at George's ford, about 2 miles below the mouth of Stekoa, upon the Chechero, and yielded upwards of 70 cubic feet per second. Assuming 35 feet as derived from the Upper Chechero, that being rather the more abundant, 25 feet remain as the supply of the Stekoa. It is believed that this quantity may be fairly assumed; as this stream yields 21.72 per second $1\frac{1}{2}$ miles above the mouth, at the lowest stage of the water, a supply abundantly sufficient for the purpose of a canal as high up as the mouth of that stream. Any deficiency between this and the summit must be made up from other sources, which will be dwelt upon when the question of supplying the summit level shall come to be considered.

SUBDIVISION FIFTH.

From a point 550 feet above Star branch, by the Stekoa, to a point above the Great falls. Distance, 1.2 miles; ascent, 260.20 feet; ascent per mile, 216.83; locks, 32.5; general course, west and north 20° east, circuitous.

The nature of the ground embraced by this subdivision, and its sudden elevation, present the most formidable difficulties to the location and construction of a railroad, and render a resort to a canal utterly impracticable; as the extent of ground is barely sufficient for a third of the locks necessary to surmount the elevation. One or more inclined planes are absolutely necessary at this point, as it is impossible to have recourse to the agency of locomotive power. Even though the bottoms should be abandoned in the 4th subdivision, and thereby a higher elevation attained at its termination, still a uniform grade throughout both subdivisions would give an average rise beyond the limits assigned to the profitable application of that power. This uniform grade of both, however, being but 65.76 feet per mile, may be passed by locks, should this mode of communication upon the whole be deemed most advisable. With a trifling exception, the ground comprised in this subdivision may be described as continuous rocky hill sides at angles from 25° to 50° .

SUBDIVISION SIXTH.

From a point above the Great falls, by the Stekoa, to Beck's millpond. Distance, 3.7 miles; ascent, 53.41 feet; ascent per mile, 14.43; locks, 6.5; general course, north 15° east, direct.

The easy ascent and favorable character of the ground render the location and construction of any canal or railroad for this subdivision of easy execution. Rich bottoms, skirting the stream, extend to within 0.2 of a mile of Beck's

millpond; and for this distance the slopes of the hill sides never exceed 20° . It may be deemed advisable, in order to traverse the most eligible ground, to cross the Stekoa once or twice in this distance; to do which, from the narrowness of the stream, and very slight rise of the freshets, would involve a very inconsiderable expenditure. The west branch of the Stekoa, and Farris's creek, with other streams, tributaries to the main branch of the Stekoa, may be profitably dammed for the accumulation of water during the wet season.

SUBDIVISION SEVENTH.

From Beck's mill pond, by the Stekoa, to the summit level. Distance, 2.42 miles; ascent, 231.75 feet; ascent per mile, 95.76 feet; locks, 29; general course, north 10° east, circuitous.

If a higher level is not attained in the last subdivision, by leaving the immediate margin of the stream, and taking to the high grounds, it will be necessary to overcome the great elevation in this, by adopting a system of inclined planes. As the ascent is quite uniform, these would constitute principally, though at moderate angles, the line of the railroad for the whole distance. By dropping the summit, however, by a deep cut of 50 feet, the inclined planes may be reduced to two, and these at moderate inclinations; being necessary to overcome the rise of about 114 feet only in rather less than a mile from Beck's millpond. This cut will have the double effect of reducing the elevation of the summit, at the same time that the horizontal distance is increased, as the line of inclination, from the head of the inclined planes just proposed, passes through the point 50 feet below the summit, and would strike the ground some distance on the opposite side. This plane would be nearly 2.4 miles in length, with an ascent of 112 feet, or at the rate of about 47 feet per mile. A cut of the depth proposed, considering the nature of the soil, and the narrowness of the gorge of the mountain at the summit, would prove a formidable undertaking. The propriety of encountering the expense of its execution, in preference to a further application of inclined planes, is a question which can only be determined by the result of more minute surveys.

This subdivision, considered reference to a canal, has barely sufficient length for the location of the necessary number of locks and intermediate ponds, unless a higher level be assumed for the head of the sixth subdivision, or a reduction effected in the summit by a cut of 50 feet. The necessity of the latter will be discussed hereafter, when the sources of supply of water for the summit shall come under consideration.

The ground from Beck's millpond to the summit may be thus classed: 1 mile of hill sides of various inclinations up to 25° ; 0.2 bottoms; 0.6 hill sides, of the description of the first; and 0.6 narrow bottoms.

SUBDIVISION EIGHTH.

From the summit, by the Little Tennessee river, to a point just below Brown's. Distance, 30.72 miles; descent, 381.51 feet; descent per mile, 12.41 feet; locks, 48; general course, north 5° west; last 8 miles north 50° west; serpentine.

Having attained the summit, the face of the country assumes quite a different character from that traversed in the ascent of the Blue ridge. Instead of the valley being limited as heretofore, with but one or two exceptions, to the width of the streams, it now spreads out into a beautiful rolling coun-

try, varying in breadth from 400 yards to 3 or 4 miles. The bottoms, which previously skirted the streams in narrow and disconnected strips, were found in this subdivision of considerable widths upon one or other, but generally upon both sides throughout its whole length. At the few points at which the high grounds approach the stream, the slopes are moderate, and the ground tolerably easy of excavation. The bottoms in the descent of the Little Tennessee progressively rise in height above the summer stage of the water, attaining an elevation of 10 or 12 feet in the first 10 miles.

The stream will have to be crossed frequently in this subdivision, either for the selection of the most favorable ground, or to diminish the distance. The narrowness of the river, which, at the lower extremity of this subdivision, attains a width of but 300 or 350 feet, and the moderate height to which its waters rise, render this of easy and cheap accomplishment.

The gradual fall of the river, the character of the ground through which it runs, the nature of the soil, and the facilities for construction, unite to render any work of this subdivision an enterprise of little difficulty. Few more favorable tracts of country for either system of internal communication, situated at the very summit of the Alleghany, are any where to be found throughout the whole range; the prominent characteristics of the ground and stream being those which belong more to the lowland region than the elevated cordilleras of our own country.

The tributaries of the Little Tennessee, included in this subdivision, are very numerous, and some of them of considerable size. Those flowing in from the east are Mud, Middle, Tessentry, &c. creeks, and Sugartown fork; and from the west, Betty's, Coweta, and Chatugajay creeks, &c., all of which may be profitably used for the supply of the canal with water. The Sugartown fork, a principal branch of the Little Tennessee, heading in the Blue ridge to the eastward of the main stream, has been frequently pointed out as a route worthy of consideration to cross the mountains, and, should further surveys in this vicinity be contemplated, ought not to be overlooked. Besides having a course more direct to the head branches of the Savannah, the country itself through which the stream flows, is represented as one of the most favorable description.

SUBDIVISION NINTH.

From a point just below Brown's, by the Little Tennessee, to the mouth of Tuckaseige river. Distance, 21.12 miles; descent, 442.24 feet; descent per mile, 20.93 feet; locks, 55; general course, north 40° west, circuitous and serpentine. The direct distance of this subdivision is about 12 miles.

The valley of the Little Tennessee, which, from the summit, gradually expands to a breadth of 3 to 5 miles at Franklin, again becomes more and more contracted, until, at the commencement of this subdivision, it barely exceeds the narrow bed of the river. The extensive bottoms which skirted its margin dwindle down to narrow slips, at intervals alternating from side to side. Rocks, which on first striking the sources of the Little Tennessee, had very considerably diminished, and in some portions, subsequently, almost entirely disappeared, became progressively more abundant from Franklin, and now abound as upon the eastern face of the mountain. The bed of the stream, also, from gravelly changes to rocky, which continues to the foot of the Smoky mountain. These rocks frequently show themselves in

ledges, which, crossing the stream, form alternate basins of still water, and slight falls or rapids.

The ground presents cultivated bottoms sufficiently wide for a canal; narrow bottoms or ledges; hill sides at various angles; and rocky bluffs in the following proportion, viz. 12.6 miles bottoms and flats of unequal widths, occasionally cultivated; 6. steep hill sides, at various angles to 45° , with narrow ledges of from 15 to 25 feet in width; and 2.6 miles rocky bluffs.

By frequently crossing the river to take advantage of the more favorable side, tolerably favorable ground for a railroad or canal may be found throughout the whole route. There are, however, two or three points of very considerable difficulty, where the rocky bluffs show themselves upon opposite sides of the river, but these are limited in extent to about 1.3 miles. For about 13 miles of this subdivision, the Unakoy turnpike company have succeeded, with contracted means, in forming a tolerably good road on the margin of the stream. The principal tributaries for this portion of the route are Nahautahala on the west, and Rattle Snake and Lower Tessentry creeks on the east side.

SUBDIVISION TENTH.

From the mouth of the Tuckaseige river, by the Little Tennessee, to the point above Twenty Mile creek, where the turnpike road strikes the river. Distance, 18.22 miles; descent, 204.50 feet; descent per mile, 11.22 feet; locks, 25.5; general course, west, direct.

With the exception of the passage of the Tuckaseige, which here becomes necessary, this subdivision is decidedly more favorable than the last. The descent is less rapid, and the proportion of favorable ground much greater, as will appear from the following synopsis; 2.2 miles wide, cultivated bottoms; 7.4 bottoms 20 to 50 feet wide, hill sides at angles from 10° to 40° ; 5 miles bottoms 10 to 30 feet wide, at the foot of hills rising at slopes of from 10° to 30° ; 2.3 miles steep hills sides to water's edge; 1.1 mile rocky bluff; which, with the crossing of the Tuckaseige, includes the whole distance of 18.2 miles.

For this space the turnpike road recedes from the river but 4 miles, thus affording evidence of the practicability of the ground. The river varies from 200 to 400 feet in breadth; at one point, however, it expands to nearly 1000, and near the mouth of Eagle creek contracts itself to less than 100 feet.

Besides the Tuckaseige river, there are three principal creeks to be passed, namely, the Aquoneta, Eagle, and Hazel-nut, the latter being 65 to 75 feet wide at their mouths, respectively. The rocks increase progressively, both in size and quantity, from the commencement of this subdivision, and at its termination from its prominent feature, creating, in the beholder, apprehension for his safety, from the impending masses which seem to require but a touch to precipitate them to the depths of the ravine.

SUBDIVISION ELEVENTH.

From the point above Twenty Mile creek, where the turnpike road strikes the river, by the Little Tennessee, to the foot of the Smoky mountain. Distance, 16 miles; descent, 411.02 feet; descent per mile, 25.69; locks, 51.5; general course, north 75° west, circuitous and serpentine; direct distance about 8.6 miles.

The notes present the following peculiarities of ground, 0.1 of a mile steep hill sides to the water's edge; 3.7 rocky hill sides of from 20° to 45° , with sandy flats or bottoms of from 15 to 50 feet wide, including 0.6 of rocky bluffs; then 12.2 miles through the Smoky mountain, already referred

to as presenting the most formidable impediments to the creation of any species of communication.

As the fall in the first 2.5 miles is but 108.92, or 43.51 feet per mile, and in the remaining 13.5 miles only 302.10 feet, or 22.37 feet per mile, the average of which is within the limits for the profitable construction of either canals or railroads, these impediments arise less from the depression than the peculiar accidents of the ground. Below the point at which the Unakoy turnpike leaves the river, the mountains rise abruptly from the water's edge, at angles from 40° to 60° , to the height of many hundred feet; or, when this is not the case, still more difficult obstacles present themselves in rocky bluffs, on alternate sides of the river, extending to the base of the mountains. The stream is circuitous and various in its passage through the Smoky mountain, from 60 to 550 feet in breadth; the whole distance of 27 miles, from Hay's to the base, being entirely uninhabited.

With the exception of Twenty Mile creek, 40 feet, and Chiowee river, 60 feet wide at their mouths, the number and size of the streams falling into the Little Tennessee, in this subdivision, are quite inconsiderable.

SUBDIVISION TWELFTH.

From the foot of the Smoky mountain, by the Little Tennessee river, to Russell's ferry. Distance, 14.97 miles; descent, 76.08 feet; descent per mile, 5.02 feet; locks, 9.5; general course, north 70° west, circuitous; direct distance about 9.6 miles.

With the exception of four points, where the slopes of the mountain approach the river, the whole north margin is an extensive fertile bottom to Russell's ferry. Nor does any serious difficulty exist in regard to these exceptions for the construction of either a canal or railroad, as there is left, in every instance, between the hill and the river, a space of about 50 feet in width, which, though insufficient for the entire purposes of a canal, will relieve the work in a great measure from side cutting. These spurs are the base of the Chilhowee mountain, 0.9; at the next point below 0.6; the point just above McGhee's ferry, 0.5; and at Four Mile creek, 0.4 of a mile. The only streams of consequence emptying into the river from this side, and which could be used for feeding a canal, are Miller's creek, 15 feet, Abraham's branch, 115 feet, and Four Mile creek, 30 feet wide at their mouths, respectively. The hills approach the river upon the opposite side for a greater extent by 1.3 miles than upon the side the levels were made. The principal streams flowing from the south are Talassee and Siteco creeks.

Synopsis of the Toogaloo and Little Tennessee route.

Subdivisions.	Localities.		General course.	Character of course.	Distance in miles.	Ascents in feet.	Descents in feet.	Average grade per mile in feet.	Number of locks.	Total distance in miles.	Total ascents in feet.	Total descents in feet.	Total number of locks.
	From	To											
1	Mouth of Panther's creek	Mouth of Lick-Log creek	North	Circ. & mod. serp.	6.75	137 77	-	20.41	17.	6.75	137.77	-	17.
2	Mouth of Lick-Log creek	Mouth of Chechero creek	N. 10° E.	Direct & serp.	3.92	239.52	-	60.33	30.	10.67	377.29	-	47.
3	Mouth of Chechero creek	Mouth of Stekoa creek	N. 30° W.	Direct & serp.	5.45	447.34	-	82.	56.	16.12	824.63	-	103.
4	Mouth of Stekoa creek	Point 550 feet above Star branch	S. 75° W.	Direct & tol. serp.	3.90	75.19	-	19.27	9.5	20.02	899.82	-	112.5
5	Point 550 feet above Star branch	Point above the Great falls	W. & N. 20° E.	Circuitous	1.20	260.20	-	216.23	32.5	21.2	1,160.02	-	145.
6	Point above the Great falls	Beck's millpond	N. 13° E.	Direct	3.70	53.41	-	14.43	6.5	24.92	1,213.43	-	151.5
7	Beck's millpond	Summit level	N. 10° E.	Circuitous	2.42	213.75	-	95.76	29.	27.34	1,445.18	-	180.5
8	Summit level	Point just below Brown's	N. 5° & 50° W.	Serpentine	30.0	-	381.51	12.41	48.	58.06	-	381.51	228.5
9	Point just below Brown's	Mouth of Tuckaseige	N. 40° W.	Circ. & serp.	21.12	-	412.24	20.93	55.	79.18	-	823.75	283.5
10	Mouth of Tuckaseige	Point above 20 Mile creek	West	Direct	18.22	-	204.50	11.22	25.5	97.40	-	1,028.25	309.
11	Point above 20 Mile creek	Foot of Smoky mountain	N. 75° W.	Circ. & serp.	16.	-	411.02	25.69	51.5	113.40	-	1,439.27	360.5
12	Foot of Smoky mountain	Russell's ferry	N. 70° W.	Circuitous.	14.97	-	76.08	5.02	9.5	128.37	-	1,515.35	370.

THE SUMMIT—AND THE SUPPLY OF WATER FOR A CANAL.

It is essential to the determination of the proper mode of communication between the Savannah and Tennessee rivers, to indicate the quantity of water and the sources of supply for the purposes of a canal. The approximate estimate will be made for a canal and locks, of the dimensions of those proposed by the board of engineers for the Chesapeake and Ohio canal, in their report of 1826.

The expense per mile, per month, for evaporation, absorption, and filtration, is estimated at 120,000 cubic yards, or nearly four times the canal's prism. It is assumed that the locks would be in full operation for twelve hours a day through the whole year, six boats passing in the hour, 72 at each end, and 144 at the summit, during the day; and that the expenditure for the passage of each boat will reach the maximum of two locks full, or 830 cubic yards.

Upon these principles, the quantity of water required, from the mouth of the Stekoa, by the summit, to five miles down the Little Tennessee, an extent of 19 miles, amounts to 2,280,000 cubic yards per month, for evaporation, absorption, and filtration. To this is to be added 3,585,600 cubic yards per month, for lockage at the extremities of the summit; giving, for the total expenditure of the summit, 5,865,600 cubic yards per month, or 70,387,200 cubic yards per year.

The quantity of water necessary for the supply of a canal, east and west of the summit, may be obtained in great abundance from the main streams and their tributaries. The sources of this supply will be indicated hereafter.

It will be perceived, by reference to the table showing the discharge of the streams, that much the larger portion of water required for the supply of the summit must be drawn from the streams west of that point.

To render available as large a quantity of running water as possible, it is proposed to reduce the summit by a deep cut of about 50 feet, which will include the mouth of Betty's creek, on the Little Tennessee, and a point just above Miller's mill, on the Stekoa, upon the side of the Savannah.

This cut, of about three and a half miles in length, will bring into the summit the running water of the Little Tennessee, including Betty's creek, and so much of the Stekoa as is yielded in the first mile. Besides these streams, it is also intended to apply the waters of Mill and Mud creeks, which application can readily be made by a feeder of one and three-fourths miles in length.

These streams, gauged during a season of the lowest stage of water known since the settlement of this part of the country, yielded—

1828, April 6.	Stekoa, $\frac{1}{2}$ mile from summit	1,600 feet per sec.
"	8. Lit. Ten. just above Betty's creek	15,443 " "
"	8. Betty's creek, at the mouth	17,230 " "
"	8. Mill creek	2,378 " "
	Mud creek	9,088 " "

Amount of running water per second 45,739 cubic feet, or 53,052,411 cubic yards per year.

This quantity, which constitutes the whole amount of running water available during the driest season, is insufficient for the supply of the summit, and the requisite distance thence east and west. Any deficiency, then, must

be supplied by artificial means. For this purpose reservoirs of sufficient capacities must be established in the valleys of Betty's mill and Mud creeks, which afford peculiar facilities for this expedient. The ravine of Betty's creek, especially, offers a succession of basins, formed by the approach and receding of the hills at convenient distances and elevations.

The minimum discharge of Betty's creek, as already stated, is 17.23 cubic feet per second, which has already been taken into the estimate as running water. This creek, however, yielded, on the 5th November, 30 hours after a succession of rains, 79.306 cubic feet per second, its estimated proportion of 150,388 feet, the discharge of the Little Tennessee immediately below the mouth of the creek; and on the 12th of the same month, 28.968 cubic feet per second, rain having fallen (on the 7th) for three hours only, during the preceding 10 days.

The excess, from October to March, of the yield in the dry season, appropriated as running water, and a proportional excess in the supply of the Little Tennessee itself, just above the mouth of Betty's creek, of Mill and Mud creeks, amounting to 30.069 cubic feet per second, give a supply for the reservoirs of 17,836,206 cubic yards, which, added to the amount of running water, produce an aggregate of 71,259,358 cubic yards per annum.

For the abundant supply of a canal in its course east and west from the extremities of the 19 miles which have been treated of as the summit level, no difficulty is experienced. The running water of the Little Tennessee as far down as and including the mouth of Betty's creek, amounting to 32.673 cubic feet per second, has already been appropriated to the wants of the summit. Ten miles lower down, at the mouth of the Coweta, the Little Tennessee yields 107.438 cubic feet at the lowest stage. After deducting 32.673 feet for the Little Tennessee, just below the mouth of Betty's creek, and taking the mean of its increase, it may be estimated to yield, five miles below, 37.382 feet per second—a quantity amply sufficient for the purposes of canalling downwards from this point.

Upon the eastern side of the summit, the extent, depending principally for a supply from that point, is much greater. The Chechero, two miles below the mouth of the Stekoa, yielded, during the dry season of 1828, 70.742 cubic feet per second; and nearly an equal amount might be made available at the mouth of the Stekoa, amply sufficient for the wants of a canal from that point.

Though it may seem that the estimated demands of the canal too nearly approach the amount of water shown to be available for its use, yet it should be borne in mind that the expenditure assigned to the lockage of the summit is very liberal, furnishing the passage of 4,320 boats per month, at the rate of two locks full each, while, for the passage of the summit of the Chesapeake and Ohio canal, provision is made but for 3,600 boats, at an expenditure of one and a half locks full each.

The estimate of the quantity of running water, moreover, is based upon the yield of the driest season ever known, and the quantity appropriated to fill the reservoirs is derived from a very low estimate of the winter stage. Besides, on a number of streams within reach of the summit, as well as through the course of the lower levels of the canal route, other reservoirs may be formed for the accumulation of water. Upon the whole, from the results already arrived at, the practicability of passing the mountains in this direction does not admit of a doubt, so far as an abundant supply of water is concerned.

GAUGE TABLE--Toogaboo and Little Tennessee route.

Date.	Locality.	Quantity of water per sec- ond in cubic feet.	Distance from the summit in miles.	Remarks.
1933.				
Sept. 4	George's ford, on the Chechero -	70.742	13.3	During the admeasurement in September, the waters were at the lowest stage known since the settlement of the country.
" 5	Stekoa, 1.5 miles above its junction with the Chechero -	21.72	9.8	
" 6	Stekoa -	1.6	.5	
" "	Little Tennessee -	3.49	.3	
" "	Little Tennessee -	13.84	1.3	14th September, rained 4 hours. 1st October, rained during the whole day, having commenced the night previous. October 31st, commenced raining in the evening, and continued until 12 M. the next day. Rained slightly on the night of the 2d of November, and at one or two intervals during the 3d; and during the night of the 3d had a tolerably violent rain, which lasted until daylight on the 4th. Rained for two or three hours on the evening of the 7th, and on the night of the 13th and 19th of November.
" 8	Little Tennessee, just above Betty's creek -	15.443	3.1	
" "	Betty's creek, at the mouth -	17.23	3.1	
" "	Mill creek -	2.378	3.2	
" "	Mad creek -	9.088	4.2	
" 9	Little Tennessee -	38.309	5.	
" "	Middle creek -	17.030	11.2	
" 11	Little Tennessee, just below the mouth of Coweta -	107.438	13.7	
" "	Coweta, at the mouth -	21.833	13.7	
" "	Tasentry, at the mouth -	11.695	12.5	
Nov'r 5	Little Tennessee, just below the mouth of Betty's cr. -	150.398	3.1	
" 12	Betty's creek, at the mouth -	28.963	3.1	
" "	Betty's creek, 2½ miles above the mouth -	31.091		
" 25	Coweta cr., at the elevation of the mouth of Betty's cr. -	33.337		
" "	Tasentry creek, at the same elevation -	15.895		
" "	Middle creek, at the same elevation -	31.626		

RECONNOISSANCE OF THE SECOND ROUTE.

SUBDIVISION FIRST.

From Dandridge, Tennessee, by the French Broad, to Newport, Tennessee. Distance, 20 miles; direct distance, 12 miles; general course, east, circuitous.

Although both sides of the river present the same characteristics, consisting successively of bottoms of various widths, hill sides, and rocky cliffs, the larger proportion of favorable ground is to be found on the south side. The accidents of the ground, too, are more uniform on this than upon the opposite side, upon which, with a single exception, no one kind of margin continues for a greater extent than two miles in any one locality.

The following is the synopsis of the ground for both sides of the river: On the south side, 14.5 miles of bottoms, and 5.5 of hill sides of various angles to 25°, with an occasional rocky bluff. On the north, 12.6 miles of bottoms, 7.4 hill sides at considerable angles of inclination, and a frequent recurrence of rocky cliffs.

In the course of this subdivision, two principal streams empty into the French Broad; the Nolachucky from the north, and the Big Pigeon from the south. It is necessary, in following up either side of the river for the trace of a canal or railroad, to cross one or other of these streams. This would prove an undertaking of considerable magnitude, both on account of the breadth of the streams, and the rise of water during freshets, which attain a height of 12 or 15 feet.

SUBDIVISION SECOND.

From Newport, Tennessee, by the French Broad river, to the North Carolina and Tennessee boundary. Distance, 22 miles; general course, south 75° east, direct and tolerably serpentine.

This subdivision is terminated by the peaks of the Smoky mountain, and throughout may be classed, from its impracticable character, with the passage of the Little Tennessee through the same mountain.

The minutes made on the ground show an aggregate, on the north side, of 12.5 miles of favorable ground, such as bottoms, table land from 15 to 50 feet above the river, and moderate slopes, interspersed with steep and rocky hill sides and cliffs, which, for the quarter of a mile terminating the subdivision, are perpendicular for a height of 200 feet. Upon the south, the proportion of favorable ground is still less, comprising barely 6 miles of bottoms. For an extent of five miles there is an alternation of hill sides, with narrow rocky ledges.

As the south side is more favorable in the preceding subdivision, it becomes necessary to cross the river. This should be effected at a point near Grimes's mill, above Newport, that an eligible reach may be embraced on that side.

For 10 miles above Newport, to Osborne's falls, the ascent of the river is not very great, that distance being considered within the navigable limits; but from that point it rises very rapidly.

SUBDIVISION THIRD.

From the North Carolina and Tennessee boundary, by the French Broad river, to the mouth of Joy creek. Distance, 21 miles; general course, south 45° east, circuitous and serpentine.

The country, comprised in this subdivision, is extremely broken. The mountains are very high, and exhibit all the features of the last, except that the different varieties of ground along the margins of the river alternate with each other in more rapid succession; so much so, as seldom to preserve the same character for more than a mile.

On the east side are 8.5 miles of bottoms from 20 to 300 feet in width; 5.5 rocky cliffs and bluffs; 7 miles hill sides and rocks, at different angles, varying between a gentle slope to angles of 40° . On the west, 6.5 miles bottoms of unequal breadths; 8.2 miles steep hill sides, including a large proportion of rocky cliffs and bluffs; and 6.3 miles of hill sides, with slopes more easy and practicable.

Of the 8.2 miles of hill sides, cliffs, and bluffs, there are, in one body, commencing about 2.5 miles above the warm springs, 2.5 miles of the most difficult and impracticable character. Upon the whole, the east side opposes fewer impediments to the construction of either a canal or railroad, than the west. On the former, a very good turnpike already exists from Howrth's ferry, three miles from the commencement of this subdivision. This road, however, for 13 miles from Farnsworth's to Ivy creek, in consequence of cliffs and rocks, is constructed in the bed of the stream.

The river continues to rise considerably, and in unequal steps, throughout this subdivision; the ascent, judging by the eye, becoming more gradual at its termination. It preserves generally a uniform breadth, excepting at a point about one mile above Farnsworth's, where it expands considerably, and is filled with islands.

SUBDIVISION FOURTH.

From Ivy creek, by the French Broad river, to Jarrett's ferry, near Ashville. Distance, 19 miles; general course, south 18° east, circuitous and serpentine.

After the first three miles above Ivy creek, the valley of the river becomes more favorable, and gradually expands at the same time that the bottoms increase to the close of this subdivision. With the exception of the portion of the route already pointed out, and where the road leaves the river by Davis's branch, for two and a half or three miles, the ground is practicable for a canal or railroad within the ordinary cost.

The examination shows, on the east side, 11.7 miles of bottoms, and 7.3 of hill sides of various grades, including a number of points of rocks and a few cliffs. The ground, on the west side, is equally practicable.

Although the ascent of the river, judging from its appearance, continues pretty great, the elevations necessary to be surmounted are fully within the reach of either mode of communication. For the supply of a canal, numerous tributaries flow into the main stream from the east and west. Six feet is the height of the freshets; but the contractors for constructing the road on its margin were required to raise it only four feet above the ordinary stage of water.

SUBDIVISION FIFTH.

From Jarrett's ferry, near Ashville, by the French Broad river, to a point near Lynch's. Distance, 14 miles; general course, south 25° east, direct and serpentine.

The valley of the French Broad is still more expanded than in the pre-

ceding subdivision, and the proportion of favorable ground is much greater. The river is skirted, almost without interruption, by bottom lands in a high state of cultivation, throughout its whole extent.

A reference to the field notes shows a decided preference for the east side, upon which 13.3 miles are bottoms, generally broad and cultivated, and 0.7 of a mile only of hill sides and rocks; while, on the west, there are but 11.5 miles of wide bottoms, and 2.5 miles of hill sides, bluffs, and rocks, small stretches of which, interspersed through the bottoms, diversify the margin.

The moderate rise of the valley, the topography and the nature of the soil, throughout this extent, are all favorable to the construction of either a canal or railroad. An abundant supply of water may be obtained either from the main stream or the principal tributaries, the Homony and Swananoë creeks, as well as from others of inferior size, which flow from either side.

SUBDIVISION SIXTH.

From Lynch's, by the French Broad river, to King's. Distance, 18 miles; general course, south 5° west, tolerably circuitous and serpentine.

The valley of the French Broad, from Lynch's to King's, is much broader than any part heretofore passed over, and the bottoms are still more extensive than those below. The slopes of the hills are at smaller angles, very little obstructed by rocks or stones, and are covered with the different species of oaks, with chesnut, poplar, gum, and hickory.

The fall of the river comprised in this subdivision is very slight. This is particularly evident for the first 10 miles, in which extent, with the exception of two slight rapids, there is still or sluggish water. At Lynch's, the stream is about 200 feet broad. The road, for the most part, runs on the margin of the river. But half a mile of hill sides is to be found upon either margin. Excepting the apparent deficiency of stone for constructions, this subdivision embraces the most favorable and practicable country yet described, whether upon the French Broad or Little Tennessee.

SUBDIVISION SEVENTH.

From a point near King's, by the French Broad, to the mouth of the west fork. Distance, 16.5 miles; general course, south 55° west, direct and serpentine.

In this subdivision the west side is the most favorable, 15 of the 16.5 miles being bottom lands. Upon the east, the proportion of bottom to hill sides is nearly equal 8 miles of the former to 8.5 of the latter.

This disparity in the sides of the river is owing to the proximity of the Blue ridge, to which the French Broad here pursues a course nearly parallel. In comparison with the preceding, this subdivision is still more expanded, but has a less proportion of bottoms; and towards its upper limit the valley becomes again contracted. The main road runs upon both margins of the river, crossing thrice in the extent of the subdivision. Building stone is scarce, and does not make its appearance till at the close of this subdivision. There is every reason to believe that any work for internal communication could here be readily executed at a moderate expense.

SUBDIVISION EIGHTH.

From the mouth of the west fork of the French Broad river, by the West fork, Abraham's branch, the summit, the Frozen branch, the main

fork of the Toxaway, and the Toxaway itself, to its confluence with the Iocassa; distance, 14.5 miles; general course, south 40° west, circuitous.

The ascent from the French Broad is first by the west fork of that river for one mile, thence 2.5 miles to the summit by Abraham's branch, from the head of which, to the Frozen branch, the distance is but 330 feet, this stream being struck 750 feet below its head.

The height of the ground between the streams, upon opposite sides of the mountain, is very considerable, the soil not being marshy as between the Stekoa and the Little Tennessee. The elevation of the west fork is probably not much greater than that of the main stream just below; but throughout Abraham's branch the ascent is very considerable, the stream passing through a narrow gorge, having narrow strips of bottom, alternating from side to side the whole extent of its course. Abraham's branch, at its mouth, is from 6 to 10 feet wide. The descent upon the Frozen branch and main fork of the Toxaway is by a narrow gorge through immense piles of mountains, tolerably rapid and uniform for the first 6 or 7 miles, when there is a sudden pitch of from 200 to 300 feet in about 0.3 of a mile, from which point the stream resumes a more gradual descent, diminishing to the close of the subdivision.

The following is a description of the ground: West fork, north side, 0.7 of a mile below; 0.3 hill sides; south side, all hill sides, with the exception of two points where the hills approach from opposite sides; Abraham's branch, for the whole distance of two and a half miles, is skirted by bottoms of from one hundred to three hundred feet upon one or the other side. Frozen branch, narrow rocky ledges or flats on one or the other side for nearly the first 6.7 miles; 0.3 of a mile of rocky cliffs at the falls; then 0.5 of a mile rocky hill sides. On the east side, the remaining 0.5 mile bottoms from 100 to 300 feet wide. The west side for this distance, hill sides. East side of the Toxaway, to its confluence with the Iocassa, 1.5 miles bottoms, and 1.5 miles steep hill sides. West side, 2.5 miles bottoms, and at two points steep hill sides, each of 0.3 of a mile, having bottoms opposite.

SUBDIVISION NINTH.

From the confluence of the Iocassa and Toxaway, by the Toxaway and Keowee rivers, to the confluence of the latter with Twelve Mile river. Distance, 26 miles; general course, south 15° east, serpentine.

In this subdivision the ground becomes essentially improved towards its close. The mountains no longer compress the valleys to the limit of the streams, but leave them to meander through the rich and cultivated bottoms which occur even in this elevated section of country. Did no greater difficulties present themselves for the junction of these waters with the French Broad, than are encountered in pursuing the streams of this subdivision, it would prove an enterprise of cheap and easy accomplishment.

On the east side of the Toxaway, to the mouth of the Iocassa, are three miles of bottoms, from narrow slips to a breadth of 300 feet, and the remaining distance of 2 miles consists of tolerably steep hill sides. On the west, 3.5 of bottoms, and 1.5 of hill sides, each of the same description as those on the opposite side. In the first 7 miles of the Keowee, the west side has 4.7 miles of tolerably wide cultivated bottoms, the remaining distance being comparatively moderate hill sides. Upon the east the proportion of the same varieties of ground is as 5.5 of the former to 1.5 of the latter. From this point downward there are few interruptions to wide and

fertile bottoms. The principal tributary to the Keowee is Little river; besides the stream, it receives Visages and Shoal creeks from the west, and Crow, Mile, and ——— creeks from the east.

COMPARISON OF THE ROUTES.

It would be desirable to make a thorough comparison of the respective advantages of these routes; but, as the examinations upon the French Broad and Seneca were confined to a rapid reconnoissance, in which the elevation of the summit, or the sources and supply of water, could not be determined, this can only be made in reference to the topography of the country. As regards the elevation of the summits, and their supply of water, however, the impressions derived from such unequal means of estimation are decidedly in favor of the Toogaloo and Little Tennessee route. The advantages of each may be thus stated.

FIRST—THE TOOGALOO AND LITTLE TENNESSEE ROUTE.

The less abrupt ascent from the east to the summit, and more practicable character of the ground. The greater depression of the summit, and more ample supply of water. The greater directness of the route; and its striking the valley more centrally, and at a point of the Tennessee waters, from which the navigation is better for a large portion of the year.

SECOND—THE SENECA AND FRENCH BROAD ROUTE.

The more gradual fall of the French Broad, and the less impracticable nature of that river in its passage through the Smoky mountain, an important point, when the magnitude of any work to effect a passage through this mountain is considered.

In the breadth of the streams, rise of the freshets, nature of the soil, quality of the materials, and facilities for construction, the two routes are essentially upon an equality.

NATURE OF THE COMMUNICATION.

In fulfilment of the instructions, the advantages of the two great systems of internal improvement were noted to afford an opportunity for a judicious election. As this point can only be approximately determined where surveys, giving certain results, have been made, the remarks on this branch of the subject will be confined to the Toogaloo and Little Tennessee route, in relation to which the requisite data have been obtained.

Previously to considering the adaptation of the ground, it is proper to indicate the nature of the communications in existence, or projected, with which the proposed junction would form a connecting link, as important economical advantages would result from a system uniform throughout.

The trade of the Savannah river is carried on by steam and keel boats; the former being confined to the portion of the river below Augusta, which is deemed the head of navigation for that class of vessels; and the latter from that point to the head of the river, and thence by the Toogaloo to the mouth of Panther's creek, 38 miles above Andersonville, and by the Seneca and Keowee for about the same distance. The summer draught for boats from Andersonville to Augusta is estimated at 18 to 20 inches, and the winter from 24 to 30; and but for the intervention of Hatton's shoal, just above Andersonville, an equal draught, it is believed, could be carried as high up as Panther's creek.

Upon the west of the mountains, the highest navigable point upon the Little Tennessee is Russell's ferry, to which, by the removal of Coweta shoal, consisting of rock, and 2 or 3 shoals of gravel, as much water may be carried as to the mouth of the Clinch, the draught to which, in the boating season of six months, is from 30 to 36 inches. For the remaining months of the year, the depth is seldom greater than 18 inches. The navigation of the Tennessee does not become essentially better until the passage of the Suck, 160 miles below. In March, 1828, the steamboat Atlas, drawing from 30 to 36 inches, came within three miles of Russell's ferry, at the height of water found for about 4 months in this river, in which the freshets vary from 8 to 16 feet, according to the locality.

By these statements, derived from information received in that section of country, it would appear that the facilities of navigation to Russell's ferry, on the Little Tennessee, and Andersonville at the confluence of the Seneca and Toogaloo, are equal. The distance between these points may be taken, therefore, as the minimum extent for any junction between the Savannah and Tennessee rivers. As the object of this junction is to afford a market for so much of the valley of the Tennessee as lies above the Muscle shoals, it is presumed that the means of communication at present afforded by the streams west of the mountains, will, until a distant date, be deemed equal to the wants of the country. A canal, therefore, as the mode of crossing the mountain, so far as this valley is concerned, offers the greater advantage. But, to make such a work fully effective during the whole year, its eastern termination should be at Augusta, from which place a choice is left either to descend the river to Savannah by steamboats, or proceed to Charleston by the railroad now under successful prosecution.

Upon this subject, then, the following conclusions are arrived at. Should the junction proceed from Andersonville, a canal would be the more eligible, as boats from Augusta, constructed for a double species of navigation, could, without a reshipment after passing the canal, again take to the stream, and descend the Tennessee during six months of the year. If, however, it be proposed to form the junction as low down as Augusta, then it is believed that a railroad would be preferable, as it would form, with the Charleston and Hamburg railroad, an uninterrupted line of this description stretching beyond the mountains.

But, after all, the question of preference depends more upon the prominent peculiarities of the route itself, than any other considerations. The rapid ascent of the Blue ridge precludes the resort to a canal, unless large portions of favorable ground be abandoned, in order to equalize the steps to the summit, and thus, by distributing the locks, give space for their construction. For this mode, too, there would be an excessive quantity of cutting through the steep hill sides, which form so large a portion of the whole route. These considerations are conclusive against this species of communication; while the greater ability to overcome sudden elevations, the comparatively less amount of hill side cutting, and the abundance of water power for inclined planes, seem to give a decided preference to a railroad.

GENERAL REMARKS.

There is perhaps no portion of the United States, the intercourse of which with the commercial world is attended with greater difficulties than the country drained by the Tennessee and its tributaries above the Muscle shoals.

Hemmed in on all sides by this formidable obstruction, and the elevated barriers of the Cumberland and Alleghany mountains, the products of this section of country can only reach a market, by the difficult passage of the shoals, to the Ohio, or the equally tedious and expensive use of wagons across the mountains, to some point upon the Atlantic waters. It is chiefly by the latter mode that the return trade is carried on to the valley of the Tennessee from certain points upon the Atlantic board, or from Nashville.

The principal exports are grain, cotton, hemp, tobacco, feathers, beeswax, ginseng, &c.; for which are received dry goods, groceries, cutlery, &c. The cost of transportation from Lynchburg, Virginia, to Dandridge, Tennessee, is \$3 25, and, from Nashville to the same place, \$2 25 per hundred. Taking a mean as the cost of transportation to any point of the valley of the Upper Tennessee, we have \$2 75 per hundred, or at the rate of \$54 per ton. To this should be added the freight to Lynchburg or Nashville from the seaport on the Atlantic or Gulf, increasing still further the exorbitant amount.

Wagons, occasionally, during the impracticable stages of the rivers, carry the produce of this section of country to Baltimore and Philadelphia, consuming, in going and returning, from 50 to 60 days, at the average rate, to and from these cities, of \$4 50 per hundred, or \$90 per ton.

A junction of the Savannah and Tennessee rivers, between the navigable points, by some rapid and economical means of transit, would relieve this isolated district from the inconveniencies under which it at present labors. Instead of encountering the dangers and delays of the Muscle shoals in the passage to New Orleans, or the more tedious use of wagons by the route to the Atlantic, a direct, expeditious, and cheap means of transportation would be opened throughout the whole year, from Russell's ferry to Augusta, 256 miles, or to Charleston or Savannah, of 290 miles. This improvement effected, the Tennessee from the Muscle shoals upward to the mouth of the Holston, a distance of 270 miles, and thence for some distance up its several tributaries, the Little Tennessee, Holston, French Broad, and Clinch river, (susceptible of being adapted to steam navigation,) would become an animated scene of traffic for 8 months in the year, which could not fail to give an impulse to the industry, and enhance the value of the fertile and extensive valley drained by these numerous streams.

The above remarks apply to the advantages which would result from the proposed undertaking in the present condition of the navigation of the Tennessee. Should, however, the obstructions at the Muscle shoals be so far overcome as to admit the passage of steamboats, the benefits of the projected junction would be greatly increased, as a direct intercourse would thereby be opened between the States of Georgia and South Carolina, and the country watered by the Upper Mississippi and its tributaries. A glance at the map shows that the shortest route from the mouth of the Ohio to the Atlantic seaboard, is by the Savannah river. This distance, measured on the general course of the rivers, is but 1,000 miles, namely:

From the mouth of the Ohio to the mouth of the Tennessee, 45 miles.

From the mouth of the Tennessee to Russell's ferry, 18 miles

above its confluence with the Holston, - - - 565 "

From Russell's ferry, by the Little Tennessee and Savannah,

to Savannah, - - - - - 390 "

1,000 miles.

From the mouth of the Ohio to the Gulf, the distance by the Mississippi is 1,100 miles, 100 miles greater than to the Atlantic by the Savannah.

The comparative commercial and other advantages of these two routes can only be determined by a review of many and diverse interests and considerations, which bear more or less remotely upon the subject. As these will necessarily present themselves to any one who takes a comprehensive view of the immense extent of country and its resources, embraced or effected by the contemplated improvement; and as the propriety of undertaking the work does not depend upon its being shown to afford a better outlet than the Mississippi, but upon the amount of benefit it is likely to bestow upon the region in its course now deprived of communications, I forbear unnecessarily to swell this paper by their consideration.

In closing this report, I may be permitted to remark that it is made under circumstances of disadvantage. The examinations upon which it is founded were carried on at a period too remote from the present; and the interval has been employed in too many and various other operations, under the instructions of the Engineer Department, to enable me, at this distance of time, to call up that vivid recollection of those more minute peculiarities of country, seized, but not noted, during a rapid reconnoissance so necessary to a graphic description. The resignation of one, and the lamented death of the other of my assistants, deprived me, moreover, of their valuable aid. Upon Lieutenant Wragg, who was cut off in the midst of his usefulness, while conducting the operations entrusted to him, I placed great reliance; and although the admirable manner in which he kept his books and papers has enabled me to take full advantage of them, yet I have sensibly felt the absence of his judgment and recollections to assist and refresh my own.

All which is respectfully submitted.

HARTMAN BACHE,

Capt. Top. Eng'rs, Brevet Major.

PHILADELPHIA, *January 18, 1832.*